



Native Fish of Conservation Concern in Hong Kong (Part 1)

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1. Background and Introduction

1.1 Many fauna groups in Hong Kong receive intense attention and their abundance as well as habitats are routinely monitored by the public and professionals (e.g., birds, feral cattle, wild boar); but some groups, even with many species of high conservation concern, are not under the regular spotlight of active conservation, and in many cases valid information for these groups is scarce or lacking. The freshwater fish community falls into the latter category (see Chan 1999). Because freshwater fish have been widely overlooked and there has been a lack of active (and effective) conservation action in connection with the species and habitats, many habitats for fishes are being degraded at an alarming rate. The distribution range of some species which were previously considered to be common (e.g., just ten years ago) has greatly reduced. There is thus an urgent need to evaluate the status of the freshwater fish species, before many completely disappear in Hong Kong.

1.2 In 2002, a scientific paper attempted to evaluate the status of many local fauna species, including some fishes, and the results were duly published (i.e., Fellowes *et al.* 2002). The evaluation system employed by this paper, however, did not follow the international standards for IUCN red data listing. In addition, since the paper was published, there has been no systematic evaluation to provide updated information on the local fish community.

1.3 In 2014, a certificated trainer from the IUCN redlisting process was invited by the Kadoorie Farm and Botanic Garden (KFBG) to provide a training workshop to local experts from various sectors, including environmental NGOs (eNGOs) and the Government. Following this training, some local fish species of conservation concern (e.g., some already listed in Fellowes *et al.* 2002) were selected for evaluation. The assessment took reference to the guidelines provided and practised in the workshop, and the purpose of this report and others to follow is to document the results of this evaluation.

1.4 With the provision of the updated information on the status of some selected local fishes, we hope to be able to assist local eNGOs, environmental consultancies, developers and Government departments in making informed decisions related to development projects/ proposals that might threaten the local fish communities, and we also hope that conservation action plans can be considered for the most threatened species, as soon as possible.

2. Methodology

2.1 The results of this report are based on data collected from 2008 to 2014. During this period, over 200 sites were surveyed within the territory of the Hong Kong SAR, including remote islands (remark: one site can represent one section/ tributary of a stream, e.g., Hoi Ha Stream and Pak Sha O Stream are considered to be two separate sites, athough they are in the same stream system; various tributarities of the Ma Wat/ upper Ng Tung River system (such as Kau Lung Hang Lo Wai, Tai Wo) are considered to be different sites; 31 field sites were surveyed by Chong and Dudgeon (1992) and 43 sites were surveyed by Chan (2001)), and biodiversity hot spots were inspected regularly. There is natural concern about the exact disclosure of the locations of these sites, as this could attract collection by aquarists/ traders of species that are already in low numbers in the wild (e.g., the impact of such collection on fish populations is widely recognised in the scientific community; see Yamasaki and Tachihara (2006), Nip (2010)). Fishes at all sites were surveyed by snorkeling (see Cover Photo)/ direct observation along the streamside/ bank (sometimes using binoculars) and recorded by waterproof cameras (e.g., Sanyo Xacti CA8, Canon IXUS 870IS with housing WP-DC26, Canon Powershot G9 with housing WP-DC21, Canon Powershot G10 with housing WP-DC28, Canon IXY 510IS with housing WP-DC32). All species in the present report



can be confidentally identified in the field. Photographs (all taken in Hong Kong and most taken in the original habitats) of the species are presented in the relevant appendices.

2.2 Personal observations by local amateur/ professional experts were also gathered to supplement the findings in this report. The observations were made in recent years (e.g., after 2000). Data from other sources such as pertinent literature and Environmental Impact Assessment (EIA) reports was reviewed and considered in completing the present report.

2.3 As aforementioned, the present evaluations were compiled with reference to the '*IUCN Red List Categories and Criteria, Version 3.1*', '*Guidelines for Using the IUCN Red List Categories and Criteria*' and '*Guidelines for Application of IUCN Red List Criteria at Regional and National Levels*' (all are open-accessed documents; <u>https://www.iucnredlist.org/resources/grid/guidelines</u>). Area of occupancy (AOO) is estimated using a map with grid lines as shown in **Figure 1** and/ or hiking maps of Hong Kong districts (also with grid lines) by the Lands Department. Extent of occupancy (EOO) is estimated using the 'area measuring tool' in the GeoInfo Map website (http://www2.map.gov.hk/gih3/view/index.jsp) of the Lands Department. The evaluations were also reviewed by local ecologists, Prof. David Dudgeon and Dr. Bosco Chan, who have considerable experience of aquatic ecosystems in Hong Kong and South China.

3. Results

3.1 The species reported in the present document include: *Anguilla japonica*, *Anguilla marmorata*, *Awaous melanocephalus*, *Acrossocheilus beijiangensis*, *Acrossocheilus parallens* and *Channa asiatica*. The first three are diadromous species and the latter three are primary freshwater species. Their ratings are as follows:

Species Name	Level of risk
Anguilla japonica	Endangered
Anguilla marmorata	Near Threatened
Acrossocheilus beijiangensis	Endangered
Acrossocheilus parallens	Endangered
Awaous melanocephalus	Vulnerable
Channa asiatica	Near Threatened

3.2 Detailed evaluation results for each species and conservation recommendations are presented in relevant appendices (Appendix 1: Anguilla japonica, Appendix 2: Anguilla marmorata, Appendix 3: Acrossocheilus beijiangensis, Appendix 4: Acrossocheilus parallens, Appendix 5: Awaous melanocephalus and Appendix 6: Channa asiatica).

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Figure 1. A Hong Kong map with 1 km² grid lines.





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1. Classification/ Names

Scientific Name	:	Anguilla japonica Temminck & Schlegel, 1846
Order	:	Anguilliformes
Family	:	Anguillidae
Synonym(s)	:	Anguilla remifera Jordan & Evermann, 1902 Anguilla nigricans Chu & Wu, 1984
English common name(s)	:	Japanese Eel
Chinese common name(s)	:	白鱔, 鰻魚, 鰻鱺, 日本鰻, 日本鰻鱺
Other common names	:	ウナギ (Japan), 뱀장어 (Korea), Ubod (Philipines)

2. Geographic Range

2.1 Widely distributed in East Asia: Japan, China, Korea, Taiwan and The Philippines (the northern part).

2.2 In Hong Kong, it has been recorded in Mai Po, the North District, Lantau, Tolo Harbour, Sai Kung and on Lamma Island.

3. Habitat and Ecology

3.1 In general, the breeding ground for this species is considered to be oceanic. Larvae actively migrate to coastal zones; some migrate to freshwater environments and some stay along the shore (i.e., facultative catadromous). After they become mature, they migrate back to the same breeding ground for reproduction.

4. IUCN Global Red List Status and/ or International/ Regional Conservation Status

4.1 This species is considered to be Endangered (2014) under the global IUCN Red List.

5. Local Conservation Status Assessment

5.1 This facultative catadromous species was recently declared to be Globally Endangered by the IUCN (<u>http://www.iucnredlist.org/details/166184/0</u>), primarily due to observed population decline. It is considered to be a panmictic species (i.e., all individuals derive from one breeding population), based on molecular analyses (Ishikawa *et al.* 2001, Han *et al.* 2010, Minegishi *et al.* 2012).

5.2 In Asia, it is a species of high commercial value; although nearly all eels observed in markets now originate from eel farms, the fry to support the culture business are still collected from the wild, and overfishing (of the fry) would be the main contributing factor to the global population decline (see http://www.iucnredlist.org/details/166184/0 for details).



5.3 *A. japonica* was considered to be 'common' in the Pearl River area and about 70 tonnes (wild-caught) were imported to Hong Kong each year in the 1960s (Williamson and Boëtius 1993). But at least one recent study has indicated that this species is no longer 'common' in the region (Li *et al.* 2011).

5.4 In Hong Kong, the coastal marshy areas, the fish pond areas and also the river systems (e.g., the Shenzhen River) in the Northwest New Territories were once considered to be the prime habitat for this species (Williamson and Boëtius 1993). Unfortunately, in recent decades, many of these areas have been significantly impacted by severe pollution, urban expansion and channelisation, and there is no doubt that the overall area of suitable habitat for this species in the Northwest New Territories has reduced in size by more than 50%, although individual eels could still be observed recently at some localities in the region (e.g., Mai Po, Ng Tung River). This species can also be observed along the shore of Hong Kong; for instance, it has been observed in the mangrove area of Tung Chung and also in some estuarine areas of Tolo Harbour in recent years (as previously indicated it is a facultative catadromous species). However, it appears to be rare in the coastal areas. This species has also been observed in low-lying, small-sized streams with sand and gravel bottoms, and has even been observed in some small streams on remote islands (e.g., Lamma Island). The abundances observed in these habitats was always very low (e.g., one or two individuals).

5.5 Overall, as this species is panmictic, it is considered that Hong Kong's subpopulation would also follow the decreasing trend of the global population; thus in Hong Kong it is also considered to be **Endangered** (EN A2bc, following the global assessment). Also, as this is a panmictic species, rescue effect is considered to be non-applicable and thus the rating is not downlisted.

6. Human Uses

6.1 It is a high-priced commercial species, and also an aquaculture species in Japan, Taiwan and China.

7. Main Threats to the Species

7.1 Habitat destruction, channelisation, blockage of migration pathway and pollution are the main threats that this species is facing in Hong Kong. Since it is a diadromous species, man-made structures (i.e., culvert, concrete channel, weir, dam, beam) built in estuaries or streams can greatly affect the recruitment, and thus the population size. Globally, blockage of migration pathways, habitat destruction, pollution and overfishing are the eel's main threats.

8. Conservation Recommendations

8.1 At present, no specific conservation measures are in place, although Mai Po is a protected area. Lowland streams/ marshes that this species usually inhabits are under continuous threat and not appropriately protected (i.e., pollution, haphazard urban expansion, concretisation/ channelisation) in Hong Kong.

8.2 Although it is a facultative catadromous species, many individuals were still observed in estuaries and freshwater environments (e.g., lowland marshes, lowland streams); it is thus critical to ensure that the migration pathways of this species (i.e., between the breeding habitat in the sea and the brackish/ freshwater habitats) are not blocked; for instance, the stream-ocean corridor should remain open naturally (i.e., no man-made obstacles such as dams/ weirs/ culverts/ beams), and the



stream environment such as the bottom and the flow should be maintained in a natural condition; this simply means that the entire stream/ river should remain as natural as possible.

8.3 Developments/ activities that would cause significant impacts directly on the habitats for this species (e.g., by land filling, site formation, culverting of watercourses, channelisation) should be avoided. Channelised stream sections, especially those in the Northwest New Territories, should be restored, or rehabilitated; dams/ weirs/ beams in streams/ rivers should be removed. The 30m riparian zones of the streams where this species occurs should be protected from development, and no more new development should be allowed to encroach the habitat. Unprotected habitats for this species should be incorporated into the protected area system (e.g., Country Park, SSSI, Conservation Area).

8.4 When there are new development proposals, stream works (e.g., channelisation, desilting) and making of/ amendments to land use zoning plans that would affect the habitats for this species (e.g., estuarines, lowland marshes, lowland streams), the Endangered status of this species should be highlighted, and the Government should prevent inappropriate development proposals/ land use planning/ stream works that would affect the survival of this species.

8.5 When stream channelisation is proven to be necessary (e.g., from a flood-prevention viewpoint), the proponents should leave the natural bottom of the watercourse to be channelised largely untouched, and the natural riparian zone should also be maintained as far as possible. The proponents should also review the effectiveness and adequateness of 'green measures' often adopted in local channelisation projects (e.g., rip-rap, stone gabion, cellular grassed concrete) as they may not be ecologically-friendly. No man-made obstacles (e.g., dams, weirs, beams) should be installed to affect the migration of this species.

8.6 'Desilting' would occasionally be carried out by the drainage authorities to remove the 'excessive' sediment/ gravel on the streambed, in order to reduce 'flooding risk'. This work should be carefully planned and should consider being undertaken in different phases (i.e., both spatial and temporal). If possible, the desilting works should be carried out manually (i.e., avoiding the use of heavy machines).

8.7 Due consideration should be given to include this species into the Wild Animal Protection Ordinance in order to protect it from development impacts and over-exploitation.

8.8 The authorities should also consider additional measures (e.g., new regulations) to control the release of exotic and invasive animals (e.g., through mercy release).

8.9 The conservation authority should keep monitoring the status of this species and its habitats.

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Appendix 2: Anguilla marmorata



1. Classification/ Nan	nes	
Scientific Name	:	Anguilla marmorata Quoy & Gaimard, 1824
Order	:	Anguilliformes
Family	:	Anguillidae
Synonym(s)	:	Anguilla marmolata Quoy & Gaimard, 1824 Anguilla mauritiana Bennett, 1831 Muraena manillensis Bleeker, 1864 Anguilla johannae Günther, 1867 Anguilla hildebrandti Peters, 1881 Muraena mossambica (non Peters, 1852) (misapplied)
English common name(s)	:	Giant Marbled Eel, Giant Long-finned Eel, Madagascar Mottled Eel
Chinese common name(s)	:	花錦鱔,花鰻鱺,鱸鰻
Other common names	:	オオウナギ (Japan), 무태장어 (Korea), Almang, Casili (Borirawan), Kasili (Philipines), Reus-bontpaling (South Africa), Marai, Mera (Vanuatu), Cá chình (Vietnam), Diria, Duna (Fiji), Kaee hinu, Puhi pa'a (French Polynesia), Gateng, Lembu, Lumbon, Moa, Moa kembang, Pelus, Sidang, Uling (Indonesia), Z'amab (Madagascar), Belud, Belut (Malaysia), etc.

2. Geographic Range

2.1 Widely distributed in the Indo-Pacific region: East Africa, inland Mozambique and lower Zambezi River to French Polynesia, north to southern Japan.

2.2 In Hong Kong, it can be observed in hill streams in several districts (e.g., Sai Kung, the Northeast New Territories, Lantau and the West New Territories).

3. Habitat and Ecology

3.1 In general, it is considered that the breeding ground for this species is in the ocean. Larvae actively migrate to the coastal zone; some migrate to freshwater environments but others stay along the shore (i.e., facultative catadromous). After they become mature, they migrate back to the same breeding ground for reproduction.

4. IUCN Global Red List Status and/ or International/ Regional Conservation Status

4.1 This species is considered to be of Least Concern (2014) under the global IUCN Red List. But it is considered to be Endangered in mainland China (Wang and Xie 2009), mainly due to overfishing and pollution, and it has been listed as a Class II State Protected Species (http://zdx.forestry.gov.cn/portal/bhxh/s/645/content-334732.html). It is considered to be Critically Endangered or Endangered in some provinces in Japan (http://www.jpnrdb.com). It has been



considered to be a species of global conservation concern by Fellowes *et al.* (2002). It is also considered to be a freshwater fish species of conservation concern in Hong Kong by the AFCD (http://www.epd.gov.hk/epd/english/boards/advisory_council/files/ncsc_paper01_2011.pdf).

5. Local Conservation Status Assessment

5.1 Anguilla marmorata is considered to be a very widespread, facultative catadromous species (http://www.iucnredlist.org/details/166189/0). Recent research has indicated that there are several subpopulations, and the North Pacific region contains one; this subpopulation is fully panmictic (i.e., all individuals in the North Pacific region are from the same breeding population) (see http://www.iucnredlist.org/details/166189/0) for further information). Although some regional populations are facing threats such as overfishing and/ or habitat destruction, there is no known population decline globally, and the species now is considered to be of Least Concern (http://www.iucnredlist.org/details/166189/0); however, the IUCN redlist page of this species also indicates that close monitoring should be carried out as the eel may need to be upgraded to higher categories given that the threats facing the species are ongoing.

5.2 It is a species of very high commercial value in Hong Kong and China, as it is considered to be a 'delicacy' (Williamson and Boëtius 1993); in the 1960s, it was already considered to be 'rare' both in Hong Kong and South China (Williamson and Boëtius 1993). Currently, it is considered to be Endangered in mainland China (Wang and Xie 2009), mainly due to overfishing and pollution, and it has been listed Protected as a Class Π State Species (http://zdx.forestry.gov.cn/portal/bhxh/s/645/content-334732.html).

5.3 At present, in Hong Kong, it can be observed in hill streams not very far from the shore in several districts (e.g., Sai Kung, the Northeast New Territories, Lantau and the West New Territories), but always in very low numbers (e.g., no more than five individuals were observed in one stream; usually only one or two individuals could be observed). In the field, it is not uncommon to see hooks/ traps which may be used for capturing this species. Many streams suitable for this species in Hong Kong have been channelised in recent years, and the lower sections of some streams are even culverted; these of course greatly affect the movement of this species (e.g., migration of fish fry from the sea to the streams). All the above suggests that this species is facing many threats and is also being exploited.

5.4 Although it is not easy to observe (e.g., nocturnal and cryptic), the local population size is estimated to be less than 1000 mature individuals, based on the information collected from literature and direct field observation.

5.5 Based on the IUCN red list criterion D1, this species can be classified as Vulnerable. However, as there would be a rescue effect (e.g., local population being supplemented by individuals originating from other parts in the North Pacific region), the rating can be downlisted to <u>Near Threatened</u> (NT^{\circ}).

6. Human Uses

6.1 It is a high-priced commercial species, and also an aquaculture species in Taiwan and China.



7. Main Threats to the Species

7.1 Habitat destruction, channelisation, blockage of migration pathway and pollution are the main threats that this species is facing in Hong Kong. Since this is a diadromous species, manmade structures (i.e., culvert, concrete channel, weir, dam, beam) built in estuaries or streams can greatly affect the recruitment, and thus the population size. Globally, blockage of migration pathway, habitat destruction, pollution and overfishing are the main threats.

8. Conservation Recommendations

8.1 At present, no specific conservation measures are in place (e.g., no fish is protected by law in Hong Kong).

8.2 Although it is a facultative catadromous species, many individuals were still observed in estuaries and freshwater environments (e.g., hill streams); it is thus critical to ensure that the migration pathways of this species (i.e., between the breeding habitat in the sea and the brackish/ freshwater habitats) are not blocked; for instance, the stream-ocean corridor should remain open naturally (i.e., no man-made obstacles such as dams/ weirs/ culverts/ beams), and the stream environment such as the bottom and the flow should be maintained in a natural condition; this simply means that the entire stream/ river should remain as natural as possible.

8.3 Developments/ activities that would cause significant impact on the habitats for this species (e.g., by land filling, site formation, culverting of watercourses, channelisation) should be avoided. Channelised stream sections should be restored, or rehabilitated; dams/ weirs/ beams in streams/ rivers should be removed. The 30m riparian zones of the streams where this species occurs should be protected from development, and no new development should be permitted. Unprotected habitats for this species should be incorporated into the protected area system (e.g., Country Park, SSSI, Conservation Area).

8.4 When there are new development proposals, stream works (e.g., channelisation, desilting) and making of/ amendments to land use zoning plans that would affect the habitats used by this species (e.g., estuarines, lowland streams, hill streams), the Near Threatened status of the species should be highlighted, and the Government should prevent inappropriate development proposals/ land use planning/ stream works that would affect the survival of this species.

8.5 When stream channelisation is deemed necessary (e.g., from a flood-prevention viewpoint), the proponents should leave the natural bottom of the watercourse to be channelised largely untouched, and the natural riparian zone should also be maintained as far as possible. The proponents should also review the effectiveness and adequateness of some 'green measures' that may be adopted in any channelisation projects (e.g., rip-rap, stone gabion, cellular grassed concrete) as they may not be ecologically-friendly. No man-made obstacles (e.g., dams, weirs, beams) that would affect the migration of this species should be installed.

8.6 'Desilting' would occasionally be carried out by the drainage authorities to remove the 'excessive' sediment/ gravel on the streambed, in order to reduce 'flooding risk'. This work should be carefully planned and should consider being undertaken in different phases (i.e., both spatial and temporal). If possible, the desilting works should be carried out manually (i.e., avoiding the use of heavy machines).

8.7 Due consideration should be given to include this species into the Wild Animal Protection Ordinance in order to protect it from over-exploitation.



8.8 The authorities should also consider additional measures (e.g., new regulations) to control the release of exotic and invasive animals (e.g., through mercy release).

8.9 The conservation authority should keep monitoring the status of this species and its habitats.

9. References

Fellowes J.R., Lau M.W.N., Dudgeon D., Reels G.T., Ades, G.W.J., Carey, G.J., Chan B.P.L., Kendrick, R.C., Lee K.S., Leven M.R., Wilson K.D.P. and Yu Y.T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25: 123-159.

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Appendix 3: Acrossocheilus beijiangensis



1. Classification/ Nam	ies	
Scientific Name	:	Acrossocheilus beijiangensis Wu & Lin, 1977
Order	:	Cypriniformes
Family	:	Cyprinidae
Synonym(s)	:	Acrossocheilus wenchowensis subspecies beijiangensis Wu & Lin, 1977)
English common name(s)	:	Beijiang Thick-lipped Barb
Chinese common name(s)	:	北江光唇魚
Other common names	:	Not known

2. Geographic Range

2.1 It can be found in Fujian, Guangdong (including Hong Kong), Guangxi and Hainan. Appears to be endemic to South China.

2.2 In Hong Kong, it can be found on Lantau, in Tai Po and on Hong Kong Island. AOO is estimated to be $\sim 18 \text{ km}^2$; and EOO is $\sim 420 \text{ km}^2$. No detailed distribution is provided in order to protect the subpopulations from over-exploitation (e.g., by fish hobbyists).

3. Habitat and Ecology

3.1 This species inhabits natural streams (both hill streams and lowlying streams). It prefers areas with boulders and pools.

4. IUCN Global Red List Status and/ or International/ Regional Conservation Status

4.1 The species is considered to be of Least Concern (2011) under the global IUCN Red List. But it has been considered to be a species of global conservation concern by Fellowes *et al.* (2002). It is also considered to be a freshwater fish species of conservation concern in Hong Kong by the AFCD (http://www.epd.gov.hk/epd/english/boards/advisory_council/files/ncsc_paper01_2011.pdf).

5. Local Conservation Status Assessment

5.1 This species is a primary freshwater fish and was first recorded in Hong Kong by Chong and Dudgeon (1992). It is currently found at five localities in Hong Kong. AOO is about 18 km², and EOO is about 420 km². Two localities are adjacent to each other (in the same district) but are not interconnected; subpopulations at these two localities are declining dramatically, based on site observations. The other three localities are not close to each other and are far from the first two localities.

5.2 Threats facing the subpopulations at the five localities include inappropriate land use

planning (e.g., haphazard development along the riparian zone), discharge of wastewater into their habitats, channelisation and predation from and competition with invasive species like exotic snakeheads and cichlids. At least one locality is facing severe development pressure and it is expected that the habitat quality of this locality will deteriorate. Subpopulations at this locality and two other localities are also facing water pollution impacts because of the development along the riparian zones; in addition, these three localities are impacted by channelisation works. The subpopulations at the remaining two localities would be relatively stable but are also facing threats from invasive species. Undoubtedly, the quality of the habitats for this species has been declining, and this trend will continue. AOO and EOO are also likely to reduce in the future.

5.3 This species is also believed to be collected by local fish hobbyists; individuals of this species suspected to have been collected from the wild have been observed in local aquarium markets (Chan 2002, Tony Nip Pers. Obs.).

5.4 Based on the above, the species appears to be confined to five locations. The size of the local population is not known but two subpopulations have been showing a decreasing trend. Habitat quality has declined and is unlikely to improve in the foreseeable future. It is therefore assessed to be **Endangered** based on criterion B (EN B1ab(iii, v) + 2ab(iii, v)). The category is not downlisted as other subpopulations in mainland China are not able to replenish the local population (i.e., there are no natural linkages between the subpopulations).

6. Human Uses

6.1 This species is believed to be collected by local fish hobbyists; individuals of this species suspected to be collected from the wild have been observed in local aquarium markets.

7. Main Threats to the Species

7.1 In Hong Kong, the main threats facing this species include intensive development along the riparian zones and within the catchment areas, channelisation, discharge of wastewater into its habitats and competition with and predation from invasive species like cichlids and exotic snakeheads. The species is also believed to be collected by local fish hobbyists; individuals of this species suspected to have been collected from the wild have been observed in local aquarium markets.

7.2 In mainland China and Hainan, pollution and development (e.g., along the riparian zones) are the major threats to this species.

8. Conservation Recommendations

8.1 At present, no specific conservation measures are in place. Although two localities are in protected areas, these subpopulations are facing impacts from invasive species and threats from illegal collection.

8.2 Developments/ activities that would cause significant impacts directly on the habitats for this species (e.g., by land filling, site formation, culverting of watercourses, channelisation) should be avoided. Channelised stream sections should be restored, or rehabilitated; dams/ weirs/ beams in streams/ rivers should be removed. The 30m riparian zones of the streams where this species occurs should be protected from development, and no more new development should be allowed to



encroach the habitat. Unprotected habitats for this species should be incorporated into the protected area system (e.g., Country Park, SSSI, Conservation Area).

8.3 When there are new development proposals, stream works (e.g., channelisation, desilting) and making of/ amendments to land use zoning plans that would affect the habitats for this species (e.g., lowland streams, hill streams), the Endangered status of this species should be highlighted, and the Government should prevent inappropriate development proposals/ land use planning/ stream works that would affect the survival of this species.

8.4 When stream channelisation is proven to be necessary (e.g., from a flood-prevention viewpoint), the proponents should leave the natural bottom of the watercourse to be channelised largely untouched, and the natural riparian zone should also be maintained as far as possible. The proponents should also review the effectiveness and adequateness of 'green measures' often adopted in local channelisation projects (e.g., rip-rap, stone gabion, cellular grassed concrete) as they may not be ecologically-friendly. No man-made obstacles (e.g., dams, weirs, beams) should be installed to affect the migration of this species.

8.5 'Desilting' would occasionally be carried out by the drainage authorities to remove the 'excessive' sediment/ gravel on the streambed, in order to reduce 'flooding risk'. This work should be carefully planned and should consider being undertaken in different phases (i.e., both spatial and temporal). If possible, the desilting works should be carried out manually (i.e., avoiding the use of heavy machines).

8.6 Due consideration should be given to include this species into the Wild Animal Protection Ordinance in order to protect it from development impacts and over-exploitation.

8.7 The authorities should also consider additional measures (e.g., new regulations) to control the release of exotic and invasive animals (e.g., through mercy release).

8.8 The conservation authority should keep monitoring the status of this species and its habitats.

9. References

Chan, B.P.L. 2002. Should Hong Kong's freshwater fishes be protected by law? *Porcupine! Newsletter of the Department of Ecology & Biodiversity*, The University of Hong Kong 25: 13-14.

Chong, D.-h. and Dudgeon, D. 1992. Hong Kong stream fishes: an annotated checklist with remarks on conservation status. *Memoirs of the Hong Kong Natural History Society* 19: 79-112.

Fellowes J.R., Lau, M.W.N., Dudgeon, D., Reels, G.T., Ades, G.W.J., Carey, G.J., Chan, B.P.L., Kendrick, R.C., Lee, K.S., Leven, M.R., Wilson, K.D.P. and Yu, Y.T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25: 123-159.





Appendix 4: Acrossocheilus parallens



1. Classification/ Names

Scientific Name	:	Acrossocheilus parallens (Nichols, 1931)
Order	:	Cypriniformes
Family	:	Cyprinidae
Synonym(s)	:	Barbus parallens Nichols, 1931
English common name(s)	:	Thick-lipped Barb
Chinese common name(s)	:	側條光唇魚,石花魚
Other common names	:	Not known

2. Geographic Range

2.1 This species is found in southern China: Dong Jiang, Bei Jiang and the Xi Jiang, from Lechang, Lianshan, Heping, Lianping counties, Guangdong, and from streams on Wuzhi Mountain, Hainan Province, China. There are also records from Guangxi Province.

2.2 This species does not appear in Taiwan; the geographic range documented in the IUCN Global Redlist (<u>http://www.iucnredlist.org/details/166119/0</u>; indicating that it is present in Taiwan) is not correct.

2.3 The species appears to be endemic to South China.

2.4 In Hong Kong, this species can be found in Tai Po, Fanling and the western New Territories. AOO is \sim 9 km²; EOO is \sim 50 km². No detailed locality information is provided in order to protect the subpopulations from over-exploitation (e.g., by fish hobbyists).

3. Habitat and Ecology

3.1 This species inhabits natural streams with sandy bottom. It prefers areas with boulders and pools.

4. IUCN Global Red List Status and/ or International/ Regional Conservation Status

4.1 The species is considered to be of Least Concern (2011) under the global IUCN Red List. But it is considered to be of global conservation concern by Fellowes *et al.* (2002) (under another species name, *A. hemispinus*). It is also considered to be a freshwater fish species of conservation concern in Hong Kong by the AFCD (http://www.epd.gov.hk/epd/english/boards/advisory_council /files/ncsc_paper01_2011.pdf).

5. Local Conservation Status Assessment

5.1 This primary freshwater fish species can be found at three sites in Hong Kong; AOO is

about 9 km², and EOO is about 50 km². One of the sites is well separated from the other two. The remaining two are also not ecologically linked with each other as the stream section between them has been culverted.

5.2 The subpopulation at one site has been seriously impacted by channelisation works in recent years, and the size of this subpopulation has greatly reduced. In addition to the channelisation works, this subpopulation is also facing threats including inappropriate land use planning, haphazard development along the riparian zone, discharge of wastewater and competition with and predation from invasive species like cichlids, exotic catfish and exotic snakeheads. Although the subpopulations at the other two localities can be considered to be relatively stable, they are constantly facing human disturbance; for instance, one of these sites is regularly affected by pollutants (e.g., soap) disposed of by nearby residents who use the area as a place for washing their clothes; there are also many exotic fishes which are suspected to be released by local residents. There is also an additional residential development proposed next to the site; undoubtedly, this would increase the human disturbance facing this subpopulation. The other site is within an active firing range. The overall quality of the habitats for this species has been declining and this trend will continue. Some local collecting of this species is apparent and individuals of the species have been observed in the local aquarium markets (Chan 2002, Tony Nip Pers. Obs.). The pet trade poses additional pressure on the local population.

5.3 The actual size of the local population cannot be estimated.

5.4 Based on the threats mentioned above, this species is considered to be restricted to three locations in Hong Kong.

5.5 Following the above, this species is assessed to be <u>Endangered</u> based on criterion B (EN B1ab(iii, v) + 2ab(iii, v)). The category is not downlisted as other subpopulations in mainland China are not able to replenish the local population (i.e., there are no natural linkages between them).

6. Human Uses

6.1 Fish hobbyists collect this species from the wild; individuals have been observed in local aquarium markets (Chan 2002, Tony Nip Pers. Obs.).

7. Main Threats to the Species

7.1 In Hong Kong, the main threats facing this species include intensive development along the riparian zones and within the catchment areas, channelisation, discharge of wastewater into its habitats and competition with and predation by invasive species like cichlids and exotic snakeheads. This species is also collected by local fish hobbyists; individuals of the species suspected of having been collected from the wild have been observed in local aquarium markets.

7.2 In mainland China and Hainan, pollution and development (e.g., along the riparian zones) would be the major threats to this species.

8. Conservation Recommendations

8.1 At present, no specific conservation measures are in place. All locations are not within

protected areas.

8.2 Developments/ activities that would cause significant impacts directly on the habitats for this species (e.g., by land filling, site formation, culverting of watercourses, channelisation) should not be permitted. Channelised stream sections should be restored, or rehabilitated; dams/ weirs/ beams in streams/ rivers should be removed. The 30m riparian zones of the streams where this species occurs should be protected from development, and no new developments should be permitted. Unprotected habitats for this species should be incorporated into the protected area system (e.g., Country Park, SSSI, Conservation Area).

8.3 When there are new development proposals, stream works (e.g., channelisation, desilting) and making of/ amendments to land use zoning plans that would affect the habitats for this species (e.g., lowland streams, hill streams), the Endangered status of this species should be highlighted, and the Government should prevent inappropriate development proposals/ land use planning/ stream works that may affect the survival of this species.

8.4 When stream channelisation is considered to be necessary (e.g., from a flood-prevention viewpoint), the proponents should leave the natural bottom of the watercourse to be channelised largely untouched, and the natural riparian zone should also be maintained as far as possible. The proponents should also review the effectiveness and adequateness of some 'green measures' often adopted in local channelisation projects (e.g., rip-rap, stone gabion, cellular grassed concrete) as they may not be ecologically-friendly. No man-made obstacles (e.g., dams, weirs, beams) should be installed that would affect the movement of this species.

8.5 'Desilting' would occasionally be carried out by the drainage authorities to remove the 'excessive' sediment/ gravel on the streambed, in order to reduce 'flooding risk'. This work should be carefully planned and should consider being undertaken in different phases (i.e., both spatial and temporal). If possible, the desilting works should be carried out manually (i.e., avoiding the use of heavy machines).

8.6 Due consideration should be given to include this species into the Wild Animal Protection Ordinance in order to protect it from over-exploitation.

8.7 The Government should also consider additional measures (e.g., new regulations) to control the release of exotic animals (e.g., through mercy release).

8.8 The conservation authority should regularly monitor the status of this species and its habitats.

9. References

Chan, B.P.L. 2002. Should Hong Kong's freshwater fishes be protected by law? *Porcupine! Newsletter of the Department of Ecology & Biodiversity*, The University of Hong Kong 25: 13-14.

Fellowes J.R., Lau, M.W.N., Dudgeon, D., Reels, G.T., Ades, G.W.J., Carey, G.J., Chan, B.P.L., Kendrick, R.C., Lee, K.S., Leven, M.R., Wilson, K.D.P. and Yu, Y.T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25: 123-159.





Appendix 5: Awaous melanocephalus



1. Classification/ Nam	ies	
Scientific Name	:	Awaous melanocephalus (Bleeker, 1849)
Order	:	Perciformes
Family	:	Gobiidae
Synonym(s)	:	Gobius melanocephalus Bleeker, 1849 Chonophorus melanocephalus (Bleeker, 1849)
English common name(s)	:	Largesnout Goby
Chinese common name(s)	:	黑首阿胡鰕虎魚,黑頭厚唇鰕虎魚
Other common names	:	Not known

2. Geographic Range

2.1 This amphidromous species is widely distributed in Asia and Oceania: India, Sri Lanka, Ryukyu Islands, China, Taiwan, Vietnam, Thailand, Philippines, Indonesia, Papua New Guinea and the Solomon Islands.

2.2 In Hong Kong, this species mainly appears in the New Territories and Lantau. AOO is about 10 km². Detailed location information is not provided in order to protect the population from over-exploitation by local fish hobbyists.

3. Habitat and Ecology

3.1 This is an amphidromous species: adults live and breed in freshwater streams, larvae hatched drift downstream passively into the sea and live in the marine environment. They actively return to freshwater streams when they become juveniles. They need rapid, clean stream sections with sandy bottom as their adult and juvenile habitats.

4. IUCN Global Red List Status and/ or International/ Regional Conservation Status

4.1 It is a species considered to be of regional conservation concern by Fellowes *et al.* (2002). It is also considered to be a freshwater fish species of conservation concern in Hong Kong by the AFCD (http://www.epd.gov.hk/epd/english/boards/advisory_council/files/ncsc_paper01_2011.pdf).

5. Local Conservation Status Assessment

5.1 This is an amphidromous species: adults live and breed in freshwater streams, larvae hatched drift downstream passively into the sea and live in the marine environment. They return actively to freshwater streams when they become juveniles.

5.2 In Hong Kong, *A. melanocephalus* has been recorded in ten streams. These freshwater streams can be considered as the essential habitat for this amphidromous species (i.e., breeding



sites); based on this, AOO of this species is estimated to be about 10 km² in Hong Kong.

5.3 The abundance of this species is low in Hong Kong. Sometimes abundance observed (including both juveniles and adults) can reach around 30 individuals in a single stream; but individuals seem to be restricted to few key streams in Hong Kong, and normally less than five individuals can be observed in other streams. This reflects that the local population is indeed concentrated in several streams only. They need rapid, clean stream sections with sandy bottom as their adult and juvenile habitats and this would restrict the distribution and abundance.

5.4 The local population size also fluctuates; it is believed that both weather (e.g., affecting stream flow and water temperature) and recruitment could greatly influence the local population size. But the fluctuation cannot be considered to be extreme (i.e., a tenfold decrease or increase), based on field observations.

5.5 Although many of its habitats are facing threats such as haphazard development along riparian zones, channelisation and pollution, and thus the quality of these habitats is declining, its overall population size cannot be considered to be reducing (as it fluctuates a lot and no obvious trend can be observed so far).

5.6 Although the population size fluctuates, based on field observations, the maximum number of mature individuals of this species would always be far fewer than 250 in Hong Kong. This species is thus considered to be Endangered using criterion D (EN D). However, since this species has a pelagic larval stage in the sea and it is possible that individuals originated from other regions, such as Taiwan and The Philippines, where the species would be common, can drift to Hong Kong in ocean currents and replenish the local population, the rating of this species is therefore downlisted to <u>Vulnerable</u> (VU° D).

6. Human Uses

6.1 Some fish hobbyists collect this species from the wild. The exact location of fish should not be further disclosed in order to protect the population from over-exploitation.

7. Main Threats to the Species

7.1 Habitat destruction, channelisation, blockage of migration pathway and pollution are the main threats that this species is facing in Hong Kong and other parts of the world. Since this is an amphidromous species, man-made structures (i.e., culvert, concrete channel, weir, dam, beams) built in estuaries or streams can greatly affect the recruitment, and thus the population size.

8. Conservation Recommendations

8.1 At present, no specific conservation measures are in place.

8.2 As it is an amphidromous species, it is critical to ensure that the migration pathways of this species (i.e., between the sea and the freshwater habitats) would not be blocked; for instance, the stream-ocean corridor should remain open naturally (i.e., no man-made obstacles such as dams/ weirs/ culverts/ beams), and the stream environment including the bottom and the stream flow should be maintained in a natural condition; this simply means that the entire stream should remain as natural as possible (see Nip 2010).



8.3 Developments/ activities that would cause significant impact on the habitats for this species (e.g., by land filling, site formation, culverting of watercourses, channelisation) should be avoided. Channelised stream sections should be restored, or rehabilitated; dams/ weirs/ beams in streams/ rivers should be removed. The 30m riparian zones of the streams where this species occurs should be protected from development, and no new development should be permitted. Unprotected habitats for this species should be incorporated into the protected area system (e.g., Country Park, SSSI, Conservation Area).

8.4 When there are new development proposals, stream works (e.g., channelisation, desilting) and making of/ amendments to land use zoning plans that would affect the habitats used by this species (e.g., estuarines, lowland streams, hill streams), the Vulnerable status of the species should be highlighted, and the Government should prevent inappropriate development proposals/ land use planning/ stream works that would affect the survival of this species.

8.5 When stream channelisation is deemed necessary (e.g., from a flood-prevention viewpoint), the proponents should leave the natural bottom of the watercourse to be channelised largely untouched, and the natural riparian zone should also be maintained as far as possible. The proponents should also review the effectiveness and adequateness of some 'green measures' that may be adopted in any channelisation projects (e.g., rip-rap, stone gabion, cellular grassed concrete) as they may not be ecologically-friendly. No man-made obstacles (e.g., dams, weirs, beams) that would affect the migration of this species should be installed.

8.6 'Desilting' would occasionally be carried out by the drainage authorities to remove the 'excessive' sediment/ gravel on the streambed, in order to reduce 'flooding risk'. This work should be carefully planned and should consider being undertaken in different phases (i.e., both spatial and temporal). If possible, the desilting works should be carried out manually (i.e., avoiding the use of heavy machines).

8.7 Due consideration should be given to include this species into the Wild Animal Protection Ordinance in order to protect it from over-exploitation.

8.8 The authorities should also consider additional measures (e.g., new regulations) to control the release of exotic and invasive animals (e.g., through mercy release).

8.9 The conservation authority should keep monitoring the status of this species and its habitats.

9. References

Fellowes J.R., Lau, M.W.N., Dudgeon, D., Reels, G.T., Ades, G.W.J., Carey, G.J., Chan, B.P.L., Kendrick, R.C., Lee, K.S., Leven, M.R., Wilson, K.D.P. and Yu, Y.T. 2002. Wild animals to watch: terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs of the Hong Kong Natural History Society* 25: 123-159.

Nip, T.H.M. 2010. First records of several sicydiine gobies (Gobiidae: Sicydiinae) from mainland China. *Journal of Threatened Taxa* 2(11): 1237-1244.









1. Classification/ Nan	nes	
Scientific Name	:	Channa asiatica (Linnaeus, 1758)
Order	:	Perciformes
Family	:	Channidae
Synonym(s)	:	<i>Gymnotus asiaticus</i> Linnaeus, 1758 <i>Chaetodon chinensis</i> Bloch, 1790 <i>Channa ocellata</i> Peters, 1864 <i>Channa sinensis</i> Sauvage, 1880 <i>Channa formosana</i> Jordan & Evermann, 1902
English common name(s)	:	Small Snakehead
Chinese common name(s)	:	山斑,月鱧,七星鱧
Other common names	:	Not known

2. Geographic Range

2.1 The species is known from southern China, Taiwan and northern Vietnam.

2.2 In Hong Kong, this species mainly appears in the New Territories. AOO is about 24 $\rm km^2$ and EOO is about 557 $\rm km^2.$

3. Habitat and Ecology

3.1 This species inhabits streams, ponds and adjacent marshes.

4. IUCN Global Red List Status and/ or International/ Regional Conservation Status

4.1 The species is considered to be of Least Concern (2012) in the global IUCN Red List. It is considered to be Vulnerable in Taiwan (Chen *et al.* 2012). It is also considered to be of local conservation concern by Fellowes *et al.* (2002).

5. Local Conservation Status Assessment

5.1 This primary freshwater fish species is considered to be 'uncommon' by Lee *et al.* (2004); Chan (2001) has recorded this species at four sites (out of the 43 sites surveyed), and Chong and Dudgeon (1992) could not find this species.

5.2 In recent years, it has been recorded at 19 sites and the AOO is about 24 km² (EOO is about 557 km²). The sites where this species has been found are usually isolated from each other and not ecologically linked. The population size and trend of this species are not known.

5.3 This species is now considered to be <u>Near Threatened</u> (close to Vulnerable under criterion

D2). There is no known linkage between the local population and the mainland China subpopulations; thus the rating is not downlisted.

6. Human Uses

6.1 It is occasionally caught by locals as food. Fish hobbyists collect this species from the wild; individuals have been observed in local aquarium markets (Tony Nip Pers. Obs.).

7. Main Threats to the Species

7.1 Channelisation, competition with and predation from invasive species, development within the catchment areas of the streams, pollution and filling of freshwater marshes are the main threats that this species is facing in Hong Kong. In other parts of the world, pollution and development would be the major threats that this species faces.

8. Conservation Recommendations

8.1 At present, no specific conservation measures are in place.

8.2 Developments/ activities that would cause significant impacts directly on the habitats for this species (e.g., by land filling, site formation, culverting of watercourses, channelisation) should not be permitted. Channelised stream sections should be restored, or rehabilitated; dams/ weirs/ beams in streams/ rivers should be removed. The 30m riparian zones of the streams where this species occurs should be protected from development, and no new developments should be permitted. Unprotected habitats for this species should be incorporated into the protected area system (e.g., Country Park, SSSI, Conservation Area).

8.3 When there are new development proposals, stream works (e.g., channelisation, desilting) and making of/ amendments to land use zoning plans that would affect the habitats for this species (e.g., lowland streams, hill streams, freshwater marshes), the Near Threatened status of this species should be highlighted, and the Government should prevent inappropriate development proposals/ land use planning/ stream works that may affect the survival of this species.

8.4 When stream channelisation is considered to be necessary (e.g., from a flood-prevention viewpoint), the proponents should leave the natural bottom of the watercourse to be channelised largely untouched, and the natural riparian zone should also be maintained as far as possible. The proponents should also review the effectiveness and adequateness of some 'green measures' often adopted in local channelisation projects (e.g., rip-rap, stone gabion, cellular grassed concrete) as they may not be ecologically-friendly. No man-made obstacles (e.g., dams, weirs, beams) should be installed that would affect the movement of this species.

8.5 'Desilting' would occasionally be carried out by the drainage authorities to remove the 'excessive' sediment/ gravel on the streambed, in order to reduce 'flooding risk'. This work should be carefully planned and should consider being undertaken in different phases (i.e., both spatial and temporal). If possible, the desilting works should be carried out manually (i.e., avoiding the use of heavy machines).

8.6 Due consideration should be given to include this species into the Wild Animal Protection Ordinance in order to protect it from over-exploitation.



8.7 The Government should also consider additional measures (e.g., new regulations) to control the release of exotic animals (e.g., through mercy release).

8.8 The conservation authority should regularly monitor the status of this species and its habitats.

9. References

Chan, Bosco P.L. 2001. Sustainability and Biodiversity: The Impact, Alternative Design and Prospects for Restoration of Channelized Lowland Streams in Hong Kong. Unpublished Ph.D. thesis, The University of Hong Kong, Hong Kong.

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Lee, V.L.F., Lam, S.K.S., Ng, F.K.Y., Chan, T.K.T. and Young, M.L.C. 2004. *Field Guide to the Freshwater Fish of Hong Kong*. Hong Kong: Agriculture, Fisheries and Conservation Department.



About KFBG

Kadoorie Farm and Botanic Garden (KFBG) is situated in the rural New Territories, on the northern slopes of Tai Mo Shan, Hong Kong's highest mountain. Two steep spurs enclose its deep-set valley. Within KFBG are streams, woodlands, orchards, vegetable gardens, walking trails, live animal exhibits, floral exhibits, sustainable agriculture demonstration plots, art exhibits, a wild animal rescue centre, a native tree nursery, and, other conservation and education facilities.

In the post-war years, Hong Kong was flooded with destitute refugees. Many had traditional knowledge of crop production and livestock farming but no stock, others had land but no experience. They required support to rebuild their lives. The farm site at Pak Ngau Shek was established in 1956 as a base for livestock breeding and distribution, agricultural research, farmers training, public education and recreation. The barren slopes were terraced and planted with orchards and vegetable gardens. The development of the botanic garden began in 1963 and the plant conservation programme from 1972.

On 20th January, 1995, the Legislative Council of Hong Kong passed an Ordinance (Chapter 1156) incorporating KFBG as a non-profit corporation designated as a conservation and education centre. It is a unique public-private partnership, for while the KFBG Corporation is a public organisation, it is privately funded by the Kadoorie Foundation.

Since 1995, KFBG has been conducting a wide range of nature education, nature conservation and sustainable living programmes both on-site, and, throughout Hong Kong and South China.

In this time of severe global crisis KFBG raises awareness, undertakes rigorous science-based species conservation and ecosystem restoration, and offers new ways of thinking and living to respond to the world's problems. Hence, our work brings hope and improvement by focusing on nature conservation, sustainable living and holistic education that re-connects people with nature. By working together with the public, Governments, academia, NGOs and businesses, we can protect our common future.

Our mission is to harmonise our relationship with the environment. Our vision is a world in which people live sustainably with respect for each other and nature.

